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(54) A rupturable foil-type container end closure

(57) A container end closure comprises a rupturable closure member (1) made of metal foil, an annular rim member (3) for securement over the member 1 to the rim of a container, a pull-open member (7) bonded to the outer surface of the closure member (1) in such a way as to provide a greater resistance to rupture of the bonding than the resistance provided by the tearing strength of the material of the closure member, a pull tab (10) connected to end (8) of the pull-open member (7) and operable to cause rupture of the closure member upon manipulation of the pull tab, said end of the pull-open member being provided with a weaking groove 13 to facilitate raising of the tab and initial rupture of the closure member. The continued rupture of the closure member on pulling of the tab is guided between the ends 8 and 9 of the substantially circular member 7 to the inner edge 6 of the rim member against which the closure member is pulled to effect remaining rupture thereof. In a modification (Fig. 6), the member 7 comprises inner and outer arcuate portions between which the closure member is ruptured prior to tearing thereof against the rim edge 6.

FIG. 1

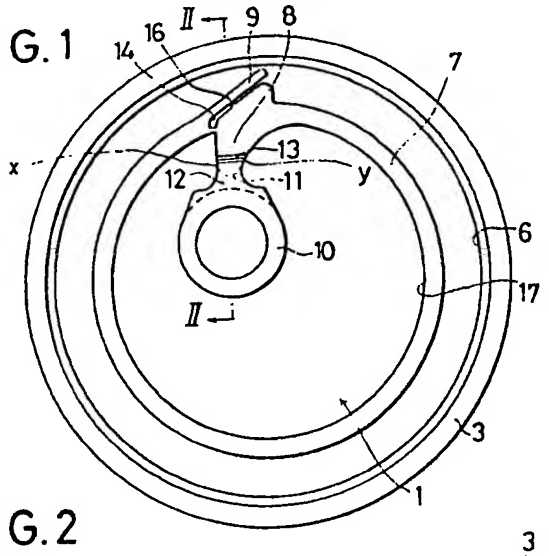

FIG. 2

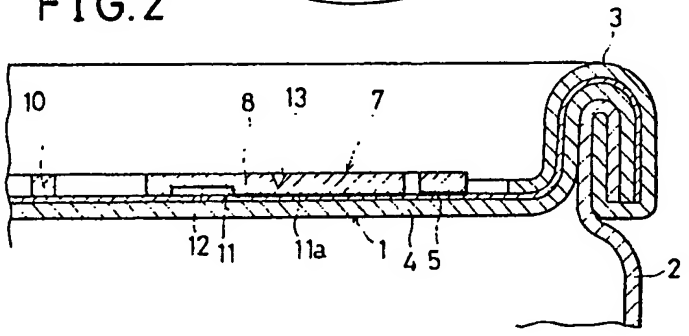

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FIG.1

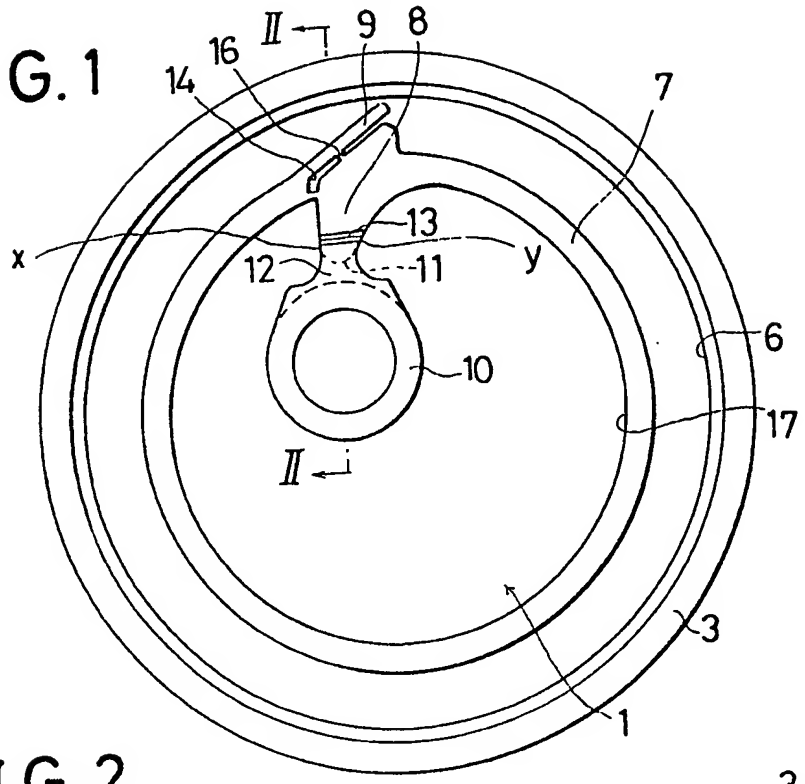


FIG.2

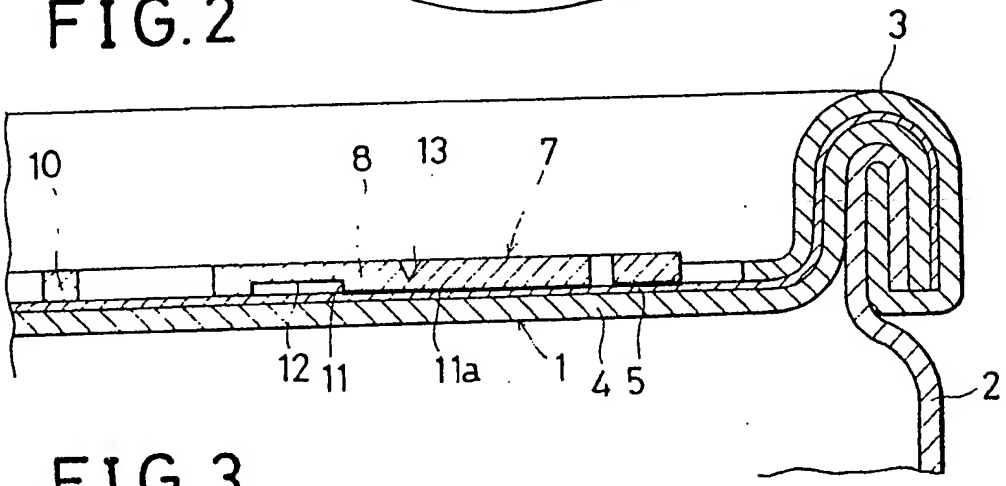


FIG.3

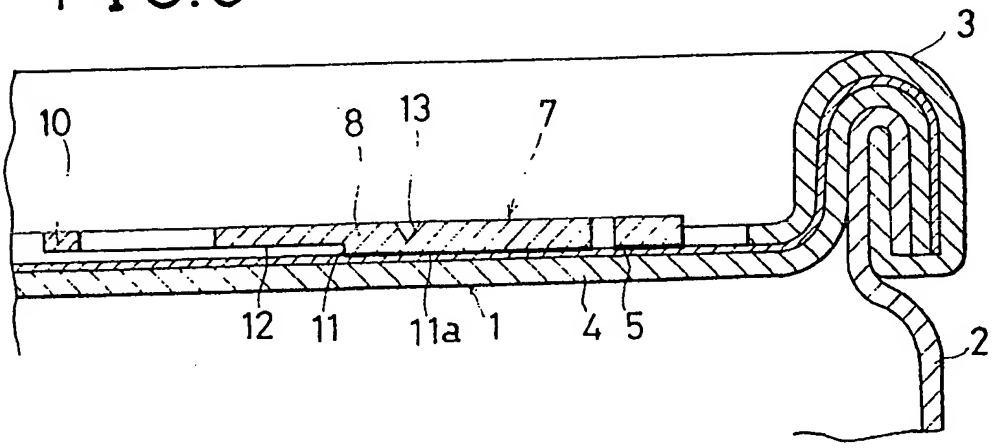


FIG. 4

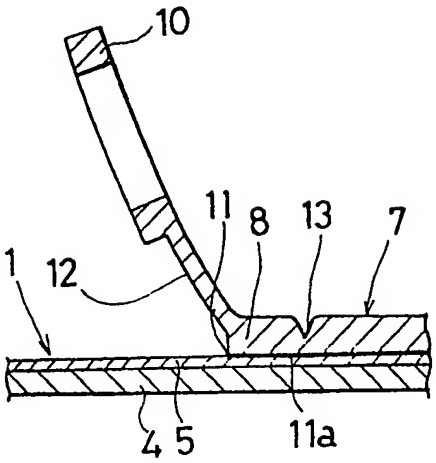


FIG. 5

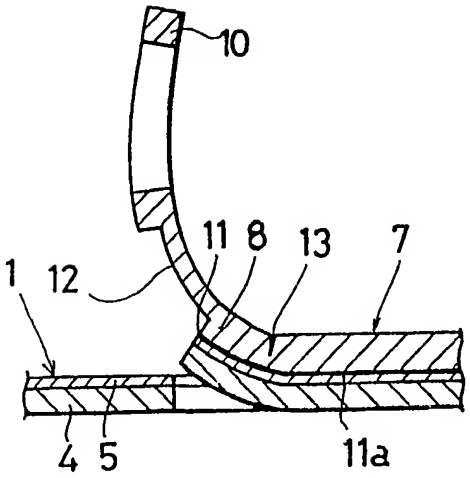


FIG. 6

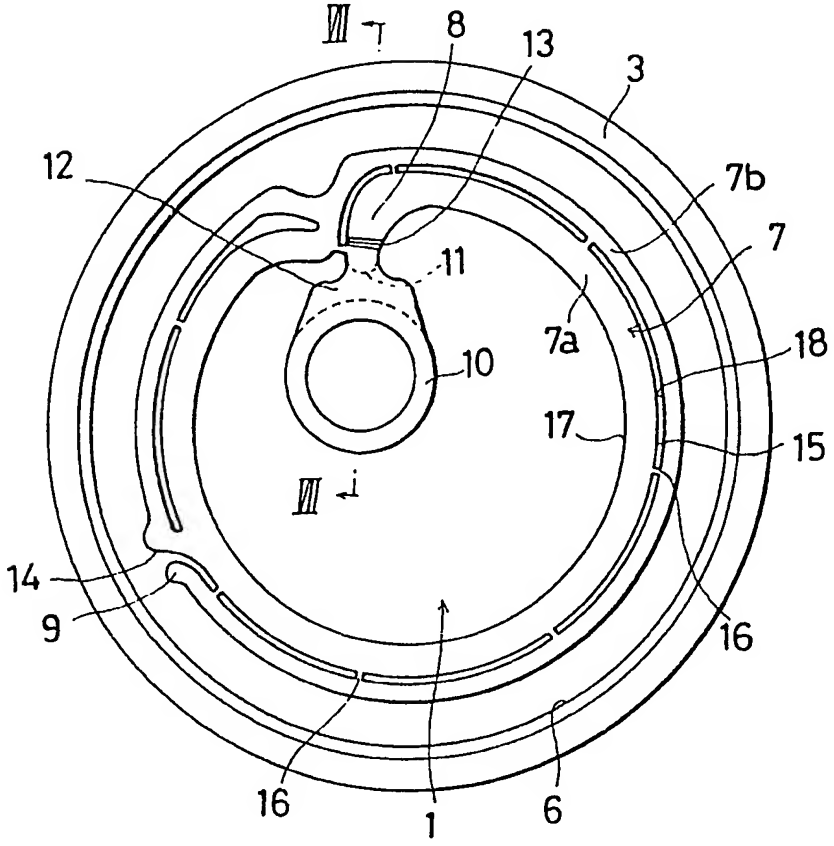


FIG. 7

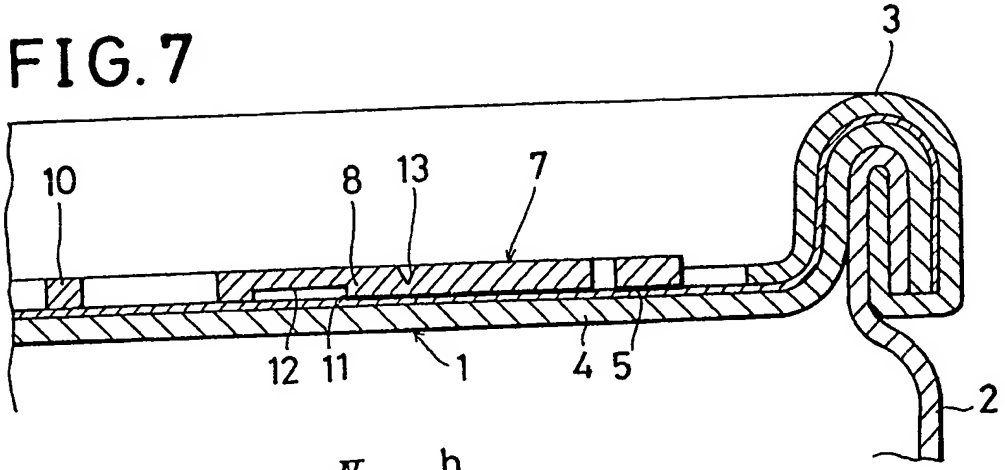


FIG. 8

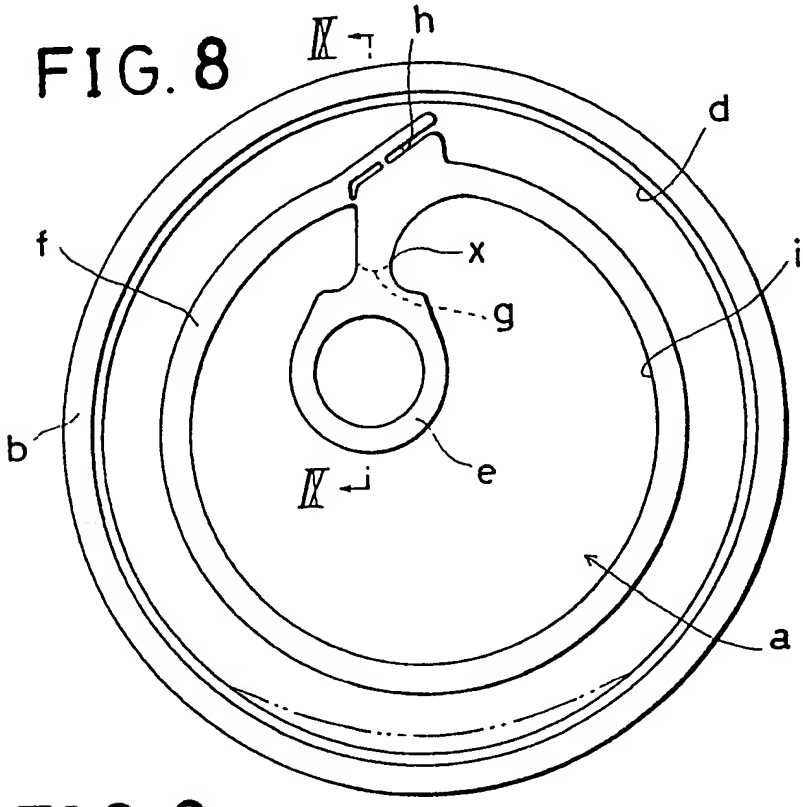
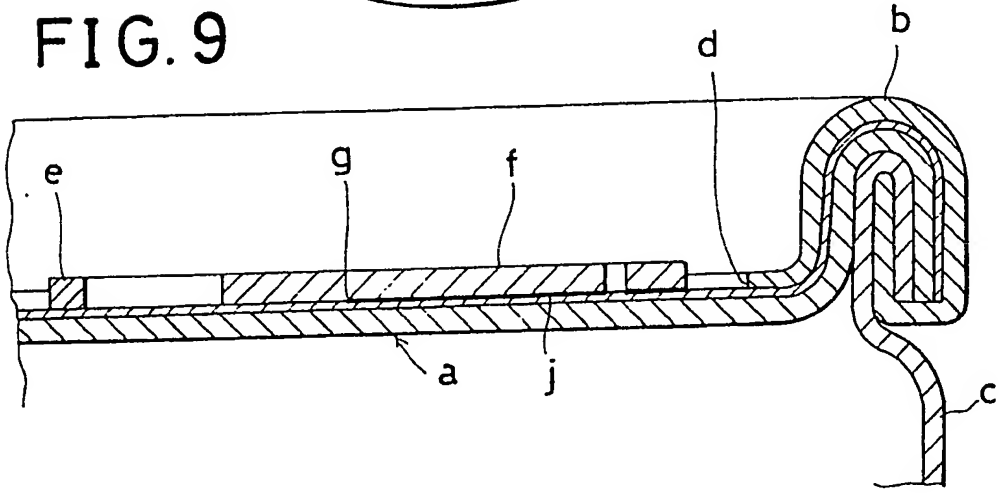


FIG. 9



SPECIFICATION

Container lid with rupturable foil

This invention relates to a container lid having a rupturable foil and which is adapted for mounting, or mounted, on the rim of an apertured container in order to tightly close or cover the aperture, in which the lid also has a pull-open member which is secured to the foil and which is operable in order to rupture the foil and thereby allow access to be had to the interior of the container.

It is known from Japanese Utility Model Registration Sho 57(1982)-177932 to provide a container lid construction of the above general type, as shown in detail in Figures 8 and 9 of the accompanying drawings. Referring now to Figures 8 and 9, there is shown a closure member *a* which is made of a lamination comprising a metallic foil, such as an aluminium foil or the like, and a thermoplastic synthetic resin layer, and the same is applied to cover an opening of a container barrel body *c* and is fixed, by curling fastening or fusion adhesion, to an edge of the opening of the container barrel body *c* via a ring-shaped member *b* which is made of metal or synthetic resin. A pull-open member *f* comprises a circular strip member made of thermoplastic synthetic resin or the like, and has at its initial end portion a pulling tab *e* for manipulating the member *f*. The pull-open member *f* is fixed to an area of an upper surface of the closure member *a* and is located inside an inner edge *d* of the ring shaped member *b*, the securement of the member *f* being by fusion adhesion or through an adjesive agent so as to be more strongly resistant than the tearing strength of the closure member *a*.

If, in order to tear the closure member *a* open, the pulling tab *e* is held between one's fingers and pulled upwards in relation to the closure member *a*, an initial tearing opening of the closure member *a* is made at the initial end *g* of an interconnection portion *j* and if the pulling tab *e* is further pulled upwards together with the pull-open member *f*, the tearing of the closure member *a* takes place along the inner edge *d* of the ring-shaped member *b*. In this case, the lifting force of the pulling tab *e* acts to deform or distort a normally flat condition of the closure member resulting in generation of a resistance force, because the pull-open member *f* is fixed so firmly, as mentioned above, to the closure member *a*. If the pull-open member *f* has such a high rigidity that it transmits a force throughout the entire length of the pull-open member *f* (even in the case of a partial slight deformation thereof), the foregoing resistance force turns into a substantial resistance force which is generated over the whole length of the pull-open member *f*, so that the foregoing initial tearing open cannot be made by a small pulling force. This is an evident difficulty or inconvenience, in that it is difficult to tear open the closure member easily e.g. by children, or the elderly. If, on the other hand, the initial end *g* of the interconnection portion *j* is not firmly fixed to the closure member *a*, there is involved the problem that pull-open member *f* may become peeled-off from the closure member *a*, with resulting impaired opening of the container. If the pull-open member f and the pulling tab *e* connected to the initial end thereof are substantially equal one to another in thickness, a comparatively large pulling force is required for largely lifting the pulling tab *e* upwards at and about the initial end *g* of the interconnection portion *j* between the pull-open member *f* and the closure member *a*, so that the foregoing inconveniences become important disadvantages. If the lifting of the pulling tab *e* is continued after the foregoing initial tearing opening is made, the closure member *a* undergoes tearing which advances along a guide edge *h* provided on the pull-open member *f* to reach the inner edge *d* of the ring-shaped member *b* and tearing, starting from a point X, and advancing along an inside edge *i* of the pull-open member *f*. If the lifting of the pulling tab *e* is further continued, the tearing which has reached the edge *d* is advanced along the inner edge *d*, while the tearing advancing along the inside edge *i* is advanced until it goes nearly half way round, but the advancing of the tearing is stopped when the center region of the closure member *a* becomes loosened or de-stressed. Accordingly, the subsequent tearing stress is concentrated only on the portion extending along the inner edge *d*, and as a result only the tearing along the inner edge *d* continues to the end, so that a complete circular opening of the container can be obtained.

However, in such a case that the pulling tab *e* connected to the initial end of the pull-open member *f* is not proper in its pulling direction, it often happens that accurate tearing along the inside edge *i* cannot be made and the tearing advance is stopped before it goes half way round, and consequently the sufficient looseness of the closure member *a* cannot be obtained, and accordingly the tearing stress does not concentrate only on the opening edge *d*, and as a result tearing is made at an intermediate area between the inner edge *d* and the pull-open member *f*, and there remains a piece of the closure member *a* which remains unremoved, in such a position along the inner edge *f* that the tearing is advanced only about 180° from the initial tearing opening, as shown by dash-dot lines in Figure 8.

The present invention has been developed primarily, though not exclusively, with a view to provide an improved easy-open closure or lid for a container, in which the foregoing inconveniences of the known construction can

be removed and the lid includes a metallic foil which can be torn-open easily and accurately by way of a pull-open member secured thereto.

The invention also seeks to provide a container lid in which the following objectives may be achieved:

1. The initial tearing-open of the closure member by a pull-open member can be carried out easily and reliably;

2. The initial tearing-open of the closure member can be carried out easily and reliably by improving the shape of the pull-open member;

3. In succession to the initial tearing-open along the inner edge of a ring-shaped rim member of the lid, the lid can be torn-open to obtain a complete circular opening without leaving any piece of the closure member on the inner edge of the ring-shaped rim member.

According to the invention there is provided a container lid comprising:

a closure member made of rupturable foil;

an annular member forming an outer rim of the closure member, for mounting on the rim of an apertured container;

a pull-open member secured to the outer surface of the closure member in such a way as to provide a greater resistance to rupture of the securement than the resistance provided by the tearing strength of the material of the closure member;

a pull tab connected to the pull-open member and operable to cause rupture of the closure member upon manipulation of the pull tab; and

an intermediate connecting portion which connects the pull tab to one end of the pull-open member, said connecting portion being weaker than at least said one end of the pull-open member whereby initial manipulation of the pull tab is facilitated by deformation of the connecting portion.

The invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a top plan view of a first embodiment of container lid according to the invention;

Figure 2 is a sectional view, taken along the line II-II in Figure 1;

Figure 3 is a sectional view, similar to Figure 2, showing a partly modified form of the first embodiment of the first invention;

Figures 4 and 5 are sectional part views, showing an opening procedure of the container lid;

Figure 6 is a top plan view of a second embodiment of container lid according to the invention;

Figure 7 is a sectional view, taken along the line VII-VII in Figure 6;

Figure 8 is a top plan view (already referred to) of a known construction of container lid; and

Figure 9 is a sectional view, taken along the line IX-IX in Figure 8.

Referring to Figures 1 to 5, numeral 1 denotes a lid or closure member which is fixed to a rim or edge of an opening of a can barrel body 2, together with a ring-shaped rim member 3. More in detail, the closure member 1 is made of a lamination of a rupturable foil 4 (preferably of aluminium) and a thermoplastic synthetic resin layer 5 affixed to an upper surface of the foil, and is intended to cover an opening defined by the ring-shaped member 3 which is similar in shape to a flange portion of a usual can cover made of metal, such as tin steel, a tin free steel or thermoplastic synthetic resin, and is fixed through fusion adhesion of the foregoing resin layer 5 thereof to a lower surface of the member 3. The closure member 1 is fixed to the rim of the body 2 by means of the ring-shaped member 3 which tightly grips them together. The closure member 1 may be made of a single layer of aluminium foil or plurality layers thereof. The fixing between the closure member 1 and the body 2 may be carried out by such a procedure that the closure member 1 is directly fixed to the edge of the opening of the body 2, for covering the opening thereof, and thereafter the ring-shaped member 3 is put on the closure member 1 and is fastened thereto.

Numeral 7 denotes a pull-open member in the form of a circular strip made of the same material as the foregoing synthetic resin layer 5, and is provided with an initial end portion 8 and a final end portion 9, the initial end portion 8 and the final end portion 9 being separably interconnected by a breakable connecting bridge 16, and the pull-open member 7 is so positioned on an upper surface of the closure member 1, as to leave a desired distance from an inner edge 6 of the ring-shaped member 3 and is secured thereto more firmly than the tearing strength of the closure member 1. Thus, there is formed an interconnection portion 11a between the pull-open member 7 and the closure member 1, and an initial end 11 of the interconnection portion is located at a position shown by broken lines in Figure 1.

The pull tab 10 can function if the same is so positioned as to be spaced from an upper surface of the closure member 1, or if it is adhered thereto so lightly as to be easily peelable therefrom. The material of the pull-open member 7 is not limited to the same as the foregoing synthetic resin layer 5, but any desired kind of material can be used as long as it is stronger than the tearing strength of the closure member 1. The means for connecting thereof to the closure member 1 is not limited to fusion adhesion, but is also sufficient to use an adhesive agent which has a bonding strength which is stronger than the

tear strength of the closure member 1.

Numeral 12 denotes a weakened part of the pulling tab 10, which is a thin part on such a side of the pulling tab 10 that it is adjacent to the initial end 11a of the interconnection portion 11 between the pull-open member 7 and the closure member 1. The thin part 12 is connected to the initial end of the pull-open member 7 and is so much thinner than the pull-open member 7 that it leaves a space between the lower surface of the thin part 12 and the surface of the closure member. Thus, it is advantageous in that the pull tab 10 can be easily bent during manipulation, due to the thin part 12, when the pull tab 10 is pulled upwards in a direction away from the closure member 1. This thin part 12 in Figure 2 may be so modified as shown in Figure 3. Namely, the upper surface of the pulling tab 10 is juxtaposed on the same level as the upper surface of the pull-open member 7, and the whole of the pull tab is made thinner so that there may be left a space between the whole of the pull tab 10 and the closure member 1.

Numeral 13 denotes a predetermined weakening made in the pull-open member 7 so that it is decreased in rigidity by making a recess therein. The weakened part is made at such a position of the upper surface of the initial end portion 8 of the pull-open member 7 which corresponds to a position more or less advanced from the initial end 11 of the interconnection portion lla between the pull-open member 17 and the closure member 1. More in detail, the recess is made, for instance, by a notch of about 0.5 mm in depth in a case where the thickness of the pull-open member 7 is about 1 mm, so that there is provided in the member 7 the weakened part 13 which is smaller in rigidity than the remainder of the pull-open member 7 itself. Accordingly, such a region of the interconnection portion between the pull-open member 7 and the closure member 1 (which extends between the weakened part 13 and the initial end 11 of the interconnection portion 11a) serves as an initial stage tearing-open region to be created when the closure member 1 is torn open by way of the pull-open member 7, by lifting the pull tab 10. The weakening also facilitates manipulation of the tab 10.

Numeral 14 denotes an edge guide, directed towards the inner edge 6 of the ring-shaped member 3, that is formed on the initial end portion 8 which faces the final end portion 9 of the pull-open member 7, so that the guide edge 14 functions in such a manner that, when the closure member 1 is being torn-open by way of the pull-open member 7 by lifting the pulling tab 10, the guide edge 14 directs tearing of the closure member 1 along the initial end portion 8 of the pull-open member to advance towards the edge 6.

There will now be described a manner of opening of the container lid in the foregoing example.

If, first of all, the pull tab 10 is manipulated by being held by fingers and is pulled upwards as shown in Figure 4, the pull tab 10 is bent at the thin part 12 so to be raised easily to an upright position. On this occasion, the upward pulling force of the pull tab 10 provides a large shearing force applied nearly perpendicularly to the horizontal closure member 1 as shown in Figure 4. If the pull tab 10 is further pulled upwards, as shown in Figure 5, the initial end 11 of the interconnection portion 11a of the pull-open member 7 is lifted, by a lever action having its fulcrum at the weakened part 13, to result in cutting of the closure member 1 at the point corresponding to the initial end 11, and thus the beginning of tearing-open of the closure member 1 can be easily obtained. More in detail, in course of lifting the pull tab 10, there is generated a lifting force at such a portion of the closure member 1 that corresponds to the initial end 11 of the interconnection portion lla, and there is created a shearing force between the foregoing lifting force and a resisting force for keeping the closure member 1 in its horizontal condition. Owing to the fact that the pull-open member 7 is provided with the weakened part 13, the pull-open member 7 is decreased in its rigidity at the weakened part 13 so that the lifting force does not transmit to the whole of the pull-open member 7, and therefore the lifting force can be concentrated at the initial end of the pull-open member 7 about the weakened part 13 to give to that end a large shearing force, and thereby an initial stage of tearing-open can be easily carried out.

In the foregoing example, for decreasing the necessary shearing force, the initial end 11 of the interconnection portion 11a is formed into a semicircular one to narrow the width of the end of the pull-open member.

Next, the subsequent tearing process after the initial stage tearing open is made will be explained as follows:

If, after the initial stage tearing-open is made as mentioned above, the pull tab 10 is further pulled upwards, the closure member 1 is given a tearing starting at point X and advancing along the guide edge 14 to reach the inner edge 6 of the ring-shaped member 3, and a tearing starting at point *y* and advancing along an inside edge 17 of the pull-open member 7. Thereafter, the outside tearing advances along the inner edge 6, and at the same time the inside tearing along the inside edge 17 advances, but is stopped when it reaches nearly a middle portion of the inside edge 17 of the circular pull-open member 7. The reason for discontinuation of the inside tearing is that there is generated a looseness of the closure member 1 at the center region thereof, with the progress of the two inside and outside tearing extending

along, and thereby the concentration of the tearing stress on a portion extending along the inside edge 17 is dissipated. Accordingly, the tearing stress is concentrated only on a portion extending along the inner edge 6 of the ring-shaped member 3, and thus only the outside tearing is continued to the last to obtain a complete circular opening.

Figures 6 and 7 show another embodying example of this invention. This embodying example is substantially similar to the foregoing example, except for the shape of the pull-open member 7. In the first embodiment in which the pull-open member 7 is a substantially circular strip having closely spaced ends, in course of the tearing of the closure member 1 along the inner edge 6 of the ring-shaped member 3 by way of the pull-open member 7, if the pulling direction of the pull-open member 7 is not proper, it can happen that the closure member 1 is not torn completely along on the inner edge 6 and there is left a piece of the closure member 1 remaining unremoved (as shown by the dash-dot line in Figure 8).

For preventing the generation of such a remainder piece of the closure member in the opening of the container, in this embodying example in Figures 6 and 7, the shape of the pull-open member 7 is improved as follows.

Namely, the pull-open member 7 (made of the same material as in the foregoing example in Figures 1 to 3) is formed into a swirl-shaped (double circular) strip having an inner circular strip portion 7a extending through 360° with an initial end portion 8 to which the pull tab 10 is connected, and an extended outer circular strip portion 7b extending about 3/4 way around a circle and having a final end portion 9 provided on the inner circular strip portion 7a (end portion 9 is angularly spaced from end portion 8 by more than 420°).

The two strip portions 7a, 7b are disposed to leave a slight space therebetween, and are interconnected at several places by the several breakable connecting bridges 16. The outside edge 15 of the circular strip portion 7a is provided at a position corresponding to about 2/3 way around the circular strip portion 7a with the guide edge 14 which faces the final end portion 9 of the strip portion 7b and which directs rupture of the foil (of the closure member 1) towards the edge 6 of the ring-shaped member 3.

Next, a manner of opening of the container lid in the embodiment of Figures 6 and 7 will be explained as follows: This example is not different from the foregoing example in that, by pulling tab 10 upwards, the initial tearing opening of the closure member 1 is made by way of the thin part 12 and the weakened part 13. If, thereafter, the pull tab 10 is further pulled upwards and thereby the pull-open member 7 is lifted gradually from its initial end portion 8, a tear advancing along an outside edge 15 of the portion 7a and the inside edge 18 of the strip portion 7b and a tear advancing along the inside edge 17 of the strip portion 7a are made. If the pull tab 10 is further pulled upwards, the tear extending along the inside edge 17 of the strip portion 7a is stopped at a position where the tear has been advanced nearly half way round, because the center region of the closure member 1 becomes liable to be loosened with an advance of the tear thereof. Consequently, only the tear extending along the outside edge 15 of the strip portion 7a is continued, and this tear is directed towards the edge 6 of the ring-shaped member 3 by the guide edge 14. Thereafter, owing to the fact that such an intermedeiate region of the closure member 1 between the strip portion 7b and the inner edge 6 is kept in its tension condition, while the closure member portion along the inside edge 18 of the portion 7b has been torn off, the subsequent tearing stress is concentrated only on a portion extending along the edge 6, and accordingly the closure member 1 is torn-off along the inner edge 6 without fail and the whole surface of the closure member can be removed.

Thus, according to the disclosed embodiments of the invention, the pull tab connected to the initial end portion of the pull-open member is made weaker e.g. thinner than the pull-open member, at least at its portion which is adjacent to the initial end of the interconnection portion between the closure member and the pull-open member so that when the pull tab is pulled upwards in order to tear the closure member open, the pull tab can be raised easily nearly to an upright position vertical to the closure member, and accordingly a shearing force can be effectively applied to the initial end of the interconnection portion and consequently the initial tearing opening can be made easily and reliably. Additionally, the pull-open member is provided, at its portion slightly advanced from the initial end of the interconnection portiion, with the weakened part such as a V notch or the like, so that when the pull tab is pulled upwards, a lever action having its fulcrum at the weakened part can be generated to exert on one end of an intermediate region between the initial end of the interconnection portion and the weakened part, and thereby an effective shearing force can be generated at the initial end of the interconnection portion, and thus the initial tearing opening can be made easily and reliably. In addition, the pull-open member is formed into such a circular strip that it has a final end portion and an initial end portion, and the initial end portion is provided with the tearing edge facing the final end portion and directing tearing towards the edge of the ring-shaped member but on the outer circumferential region of the closure

member, so that the closure member can be torn open along the edge by way of the pull-open member. Additionally, the pull-open member is formed into a vortex strip of inner and outer doubled strip portions, and the inside end portion thereof is provided with the pull tab, and the intermediate portion of the inside strip portion which faces the final end portion of the vortex strip is formed with the guide edge directing tearing towards the inner edge of the ring-shaped member, so that the closure member can be torn open by way of pulling the pull-open member reliably along the inner edge, without any remaining part of the closure member left along the inner edge, so that a complete circular opening can be carried out.

CLAIMS

1. A container lid comprising:

a closure member made of rupturable foil;

an annular member forming an outer rim of the closure member, for mounting on the rim of an apertured container;

a pull-open member secured to the outer surface of the closure member in such a way as to provide a greater resistance to rupture of the securement than the resistance provided by the tearing strength of the material of the closure member;

a pull tab connected to the pull-open member and operable to cause rupture of the closure member upon manipulation of the pull tab; and

an intermediate connecting portion which connects the pull tab to one end of the pull-open member, said connecting portion being weaker than at least said one end of the pull-open member whereby initial manipulation of the pull tab is facilitated by deformation of the connecting portion.

2. A container lid according to claim 1, in which the intermediate connecting portion is weaker than said one end of the pull-open member in that it has a lesser thickness than the thickness of the latter, measured in a direction perpendicular to the outer surface of the closure member.

3. A container lid according to claim 1 or 2, in which the closure member underlies the annular member to be located intermediate the annular member and the rim of an apertured container when the lid is mounted thereon by securement of the annular member to the rim.

4. A container lid according to any one of the preceding claims, in which at least part of the pull tab is thinner than at least the adjacent part of the pull-open member.

5. A container lid according to claim 4, in which the entirety of the pull tab is thinner than the adjacent part of the pull-open member.

6. A container lid according to any one of the preceding claims, in which the pull tab is spaced from the outer surface of the closure member, prior to initial manipulation of the tab.

7. A container lid according to any one of the preceding claims, in which said one end of the pull-open member is formed with a predetermined weakening to facilitate pivoting of the tab away from the outer surface of the closure member during initial manipulation of the tab, and to restrict the transmission of a foil-rupturing force to the following parts of the pull-open member.

8. A container lid according to claim 7, in which the predetermined weakening comprises a notch formed in the outer surface of said one end of the pull-open member.

9. A container lid according to any one of the preceding claims, in which the pull-open member comprises a substantially arcuate strip having first and second ends, the first end being connected to said pull tab so as to be the initial part of the pull-open member to be withdrawn upon manipulation of the pull tab.

10. A container lid according to claim 9, in which the second end is angularly spaced from the first end through approximately 360°, and the first end is provided with a guide edge which faces said second end and which extends outwardly towards the annular rim member so as to define a preferred initial rupture path through the closure member and towards the annular rim member.

11. A container lid according to claim 9, in which the arcuate strip is arranged so that the second end is angularly spaced from the first end through more than 360°.

12. A container lid according to claim 11, in which the arcuate strip comprises separable inner and outer strip portions, said first end of the strip being provided at one end of the inner strip portion.

13. A container lid according to claim 12, in which the second end is provided at a terminal end of the outer strip portion and is angularly spaced from the first end by more than 420°, and in which the strip is provided with a guide edge which faces said second end and which extends outwardly towards the annular rim member so as to define a preferred rupture path through the closure member towards the annular rim member.

14. A container lid according to any one of the preceding claims, in which the closure member is made of rupturable metal foil.

15. A container lid according to claim 1 and substantially as hereinbefore described with reference to, and as shown in any one of the embodiments illustrated in the accompanying drawing.

16. An apertured container having a lid according to any one of the preceding claims mounted on the rim of the aperture.

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